

the accession of the cerebral symptoms. There was no post mortem examination. He thought that lately it has been the habit of referring almost everything to bacteria. He did not think whooping-cough was of neurotic origin. It originates, in his opinion, primarily in the mucous membrane.

Dr. Allin remarked further, that he was in the habit of diagnosing whooping-cough not by the presence of suffused eyes and other symptoms of a catarrhal nature, but from their absence. A severe paroxysmal cough without catarrhal symptoms, or any other apparent adequate cause, is pretty sure to be pertussis.

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#### ART. VI.—ON MIGRAINE.

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BY migraine is meant a deep seated pain, located in the forehead, the temples, the eyes, and the anterior parts of the scalp, rarely in the occiput; most frequently of a severe aching character, though sometimes throbbing or lancinating; often accompanied by heat and soreness of the integuments, and of the eyeballs; aggravated by the upright position, movement, light, and noise; often attended by disorders of vision, as blindness of one eye, partial blindness of both eyes, shimmering of the air, the "fortification outline," etc., etc.; by disorder of the stomach, as loss of appetite, nausea, or vomiting; by a copious secretion of saliva; by constipation; by coldness of the extremities, and often of the general surface; and towards the close of the attack by a copious discharge of pale limpid urine; these attacks recurring at intervals, or induced by certain accidental circumstances, as unusual mental labor, or anxiety; over-fatigue; exposure to cold wind; too long abstinence from food followed by a hearty meal; exposure

for a long time to the glare of snow in "sunshine;" or the attacks occurring irregularly, as it were spontaneously and without any apparent cause; the intervals between the attacks being quite free from any pain or uneasiness.

The pain from organic disease of any kind, as tumor, abscess, thrombus, aneurysm, affections of the sinuses, of the bones, of membranes, or of the brain tissue itself is not included in this disorder, although patients suffering from tumors often have attacks somewhat similar—so also the pain of neuralgia (tic), of rheumatism of the scalp, the clavus of hysteria, and the vertex pain of uterine disorder are also excluded; as are also the headaches of epilepsy and of cerebral congestion and anaemia.

This affection is a disorder of sensation, not dependent on the condition of the external surface affected; the cause of the disorder is therefore to be sought within the body itself; while the nature of the disorder involves the idea of great molecular movement in the neurine of the parts which are the seat of the sensation, and of the consciousness of the sensation, and the continuance of the sensation involves the continuance of the movement. Moreover, the attacks are accompanied by considerable physical disturbance, and any attempt to think elaborately, or to perform any intellectual act greatly aggravates the pain.

The pain is most probably seated in a sensory centre, and in a perceptive centre; for the conditions involve both sensation, and consciousness of sensation, or perception; and this leads to the inquiry, whether there are certain nerve cells whose office it is to take cognizance of pain, or whether pain is an attribute of the nerve cells of common sensation, or of neurine in general.

The neurine which correlates motion into audition of its various kinds (notes high and low etc.) is unique in its attributes and functions; that is, no other neurine can prepare its functions; (it must be remembered, however, that the bare hearing a sound is a very different thing from attaching any significance to such sound heard; this being the function of ideational cells, and a result of what we term education;) the same thing holds good for all the various forms of sensation.

If the impressing force be within certain limits, the result is a perception which carries with it no discomfort; but if these limits are exceeded, the perception is accompanied with a degree of discomfort corresponding to the degree of excess; and thus the vivid light, the loud noise, the strong heat, the sharp pinch, all cause with their perception the feeling of pain; so also after excessive exercise the muscles ache, and the limbs and joints feel sore; and after long continued and severe thought, or after very intense emotion, the brain itself has diffused through it a general feeling of uneasiness allied to, if not actually, pain. It is therefore more than probable, that pain is an expression of a *state of neurine*, rather than the function of some special neurine; and this being the case, it may still be found more frequently in some parts of the nervous mass than in other parts, especially in the afferent tract, and in that part of the central or ideational tract which receives the afferent tract. Two facts which lend support to this view are, first, the great difference which we find in different persons in this susceptibility to pain; and secondly, the result of repeated impression, so that feelings which were at first pleasurable, become at length painful from constant repetition.

In migraine the true seat of pain is central; it is by no means probable that the terminal nervous fibrillae in the apparent and external seat of pain are involved, only as they are the recipients of prolonged force waves from the central neurine, which waves meeting with a point of resistance at the end of the nerve, there produce the effect felt as pain, and diffused tenderness; just as the pulse wave when resisted produces the effect felt as throbbing; and this seems the more probable, as in slight attacks, many of the central or psychical symptoms are present the pain being absent; and in somewhat more severe attacks, the pain is often not felt while at rest.

The sensory nerves distributed to the integuments which are the seat of pain and soreness are terminal branches of the fifth nerve, belonging chiefly to its ophthalmic division, with perhaps a few branches from its superior and inferior maxillary divisions; yet these two divisions do not appear to be involved. The sensory nucleus of the fifth nerve is situated in the pons

beneath the floor of the fourth ventricle, in front and to the outer side of the nucleus of the facial and abducens nerves: the nucleus of the auditory nerve is in near proximity to that of the trigeminus, so also is that of the optic nerve; while just below in the medulla oblongata is that of the vagus nerve; and in the floor of the fourth ventricle is a great vaso-motor centre. We thus find that the functions which are chiefly disordered, according to the symptoms, have their anatomical nuclei near together, so that vibrations of the neurine in one nucleus may be readily transmitted to another if excessive, or if the mobility of adjoining nuclei be increased so as to render them more susceptible of impressions. But the disturbance involves only a small portion of the nucleus of the trigeminus, those cells from which spring the fibres distributed to the forehead, temples, adjoining scalp, and eyes; those cells from which those fibres spring that supply the cheeks, the upper and lower jaws, the sides of the face, the nose, and the chin, not being affected. Moreover the pain is referred in a direction contrary to the ordinary course of the current of nerve force, for instead of the disorder being in the periphery where the pain is felt, it is cerebral; while the pain is not only peripheral, but it is also accompanied by tenderness on pressure of the parts where it is felt; and no explanation has yet been offered why only a small portion of the nucleus of the trigeminus should be so severely affected.

As, however, when the neurine is in a state of rest, there is neither inception nor transmission of nerve force; and as the phenomena of pain involve the idea of molecular movements in neurine to a greater or less degree, we may conclude that migraine is caused by abnormal molecular movements of the neurine in portions of the sensory nuclei of the trigeminal nerves, the vagi nerves, and the vaso-motor centre in the fourth ventricle, causing waves of nerve force to be transmitted along the fibres connected with these nuclei, which waves are felt as painful sensations or as other functional disorder at the terminations of these fibres; and by similar movements in centres of consciousness or perception connected therewith; while from the diffusion of force, the mobility of nuclei adjacent to the seat of the disorder is increased, so that

they are rendered more susceptible to their usual forms of impression, or else they may be actually involved in the general disorder.

It is clear that the feeling pain, involves the affection of a perceptive centre or a centre of consciousness wherever that may be located; and as in the cord we find the centres of motion and of sensation for similar parts, in close proximity to one another, the same condition may be expected to obtain in the highest centres also. Experiments tend to show that the volitional impulse, which becomes motor impulse, and subsequently muscular movement, has a specific central location for each peripheral territory; and it is by no means improbable that the centre, by which a consciousness of an impression on the periphery is effected, is placed in near proximity to that centre from which the impulse for the necessary movement has to be originated. The deep seated pain of migraine, that pain which is felt independently of the pain in the external parts, judging from the consciousness of its presence, seems to occupy a portion of the frontal convolutions of the anterior surface of the hemispheres, while we find that centres of voluntary motor impulse for these external parts are located in the same neighborhood.

It is in the first place evident that if the disorder were limited upwards to the nuclei of the fifth, the eighth, and the neighboring nerves, it would produce no effect on consciousness; and in the next place it is evident, according to our present views of the functions of nerve matter, that the seat of consciousness is the gray matter of the hemispherical ganglia. The disorder must, therefore, involve the latter as well as the former. But as the disturbance may begin in the periphery, and implicate the parts in the pons next, and the gray matter of the frontal convolutions subsequently, so in certain cases the disturbance may commence in the higher parts and be transmitted downwards.

In investigating the causes of migraine, we find that attacks are limited to certain persons; very many do not know what headache is, they are entirely exempt from it. Those that suffer from it, or other members of their family, manifest a peculiar mobility of the nervous system; most of them are

quick tempered, hasty and excitable; the females of their family are often subject to hysteria; and both sexes are liable to other forms of nervous disorder. The first cause, therefore, arises from the natural constitution of the individual, under which the neurine may become so imperfect as to be thrown into commotion by such extremely slight causes, that it may be said to become idiopathically deranged; this cause may be termed neuric.

Then again the blood plasma may become deranged, either from mal-assimilation or from imperfect depuration, the nutrition of the neurine may be imperfect in consequence; and this cause may be termed hæmic.

And again, commotions set up in some other organ, or in some other portion of the nervous tract may be extended to the parts involved in the disorder, and occasion commotion in them; and this cause may be termed reflex.

In many cases all these causes are combined; thus the neurine is imperfect intrinsically; the blood stream is impure, and there exists some distant disorder, gastric, uterine, or some other; and this variety of cause is one reason, why there are so many conflicting opinions as to the nature of the disorder. The fact is, it may be either neuric, or hæmic, or reflex; the error lying not in this theory nor that, but in that exclusiveness which would limit its production to only one cause.

Having suffered from this disorder for more than forty years, attacks have been induced by gastric disorder; by constipation; by exposure to a cold wind blowing on the forehead; by exposure to the glare of bright sunshine on the snow; by too long abstinence from food; by the same followed by a hearty meal, or by a spare meal on the plainest food, but cold; by over work and anxiety; by loss of sleep; by violent emotion; by malaria; by sudden atmospheric changes, especially by cold damp weather with easterly wind in any season; in summer by the approach of a thunder storm; while sometimes the attacks have appeared to come on suddenly without any evident cause while in apparent good health. Moreover, the attacks have varied in frequency from years or months, to not many days being passed without an attack.

I have also known it to be induced in females at every

menstrual period; in others to come on a few days after the flow has ceased; in others to be frequent through childhood and girlhood, and to disappear on the establishment of menstruation.

It is by some supposed that the neurine has the power of storing up force, as electricity is stored up in a Leyden jar, and of subsequently suddenly discharging the force so stored up; and such conditions are spoken of as "discharging lesions." There is no great objection to the term if used in contradistinction to "destroying lesions," simply implying that in such lesions force is received and transmitted by such parts of the cerebral centres as are the seat of the disorder. But in the Leyden jar the electricity is retained on an internal metallic coating, which is isolated from all other conducting bodies, contact with which has to be made to produce the discharge. While in the nerve cells the neurine is continuous with the neurine of the axis cylinders, and by them with the neurine of other cells, and with the substance of the periphery; there is no possible isolation, no means for the storage, and no contact can be made to ensure the transmission or discharge. The operations in the body bear greater resemblance to the working of a constant battery of low tension; for the oxidations or decompositions which occur in the blood and in the tissues, are tolerably uniform with the liberation and expenditure of force going on at the time; thus during sleep no food is taken, the brain is anaemic, the animal temperature is lowered, the rate of respiration and of the circulation is diminished, and the processes of secretion and of excretion are reduced to their minimum. Moreover, the matters that suffer oxidation are all on the line of retrograde metamorphosis, being prepared for rejection from the system; the force, therefore, that is liberated during such decomposition will be expended as it is liberated, either in motion, heat, or some other mode of force.

The replenishment of tissue, recombination, which occurs as the matter derived from the plasma is deposited in the tissue cells to make good their loss by oxidation, also occasions the liberation of certain amounts of force; the larger part of the combined force, however, remains with the matter deposited,

it being the more complex of the series into which the matter of the plasma is divided; a smaller portion of the combined force passes with the less complex series, with the plasma, while the liberated portion is expended as heat, motion, nerve force, or in some other mode.

The substances taken as food consist of matter in its highest and most complex combination; the complexity of combination of an atom of albumen is beyond all calculation; as this is reduced to lower and less complex combinations a large amount of the combined force is liberated, and is converted into motion, heat, or nerve force. If force becomes latent, it becomes so only by entering into combination with matter as it passes into a state of higher or more complex combination; and to be liberated and usable again as force, this matter must suffer decomposition, and must retrograde from a higher to a less complex combination. In the human body no example is known of matter being raised from a lower to a higher complexity of composition; on the contrary all its processes tend in the other direction, and result in two oxides and a crystalloid, urea, carbonic acid, and water.

If force becomes combined with matter without becoming latent, but remains sensible, the particles of the matter are thrown into a state of molecular movement, and this movement being transmitted to the atoms of surrounding matter, movements are set up in them, and the force is gradually lost by the body originally possessed of it. It would, therefore, seem that the doctrine of the storing up of force, (i. e. uncombined,) in the neurine which can be suddenly discharged is open to weighty and serious objections. Yet with these limitations the term "discharging lesion," may be well used, because it does not indicate the direction of the "discharge;" and this may be Sensory, Ideational, or Motor; that is in the direction of any nervous function.

Dilatation or contraction of the cerebral blood vessels cannot be considered causative of these attacks; for we find a similar dilatation in exophthalmic goitre, in some cases of spinal hemiplegia arising from injury to the cord about the middle or lower part of the neck, and yet there is no migraine; nor is there any in other conditions of cerebral hyperæmia;

while the relief of the pain by compression of the carotids only shows, that an arrest of the supply of arterial blood to the brain causes an arrest of its proper functional activity.

When we remember that the relation of the nerve centre to the periphery is such, that waves of force (i. e. of nerve force) are, as long as life lasts and the parts are performing their functions, being continuously transmitted from the periphery to the centre, and from the centre to the periphery, it follows as a necessary corollary that variances in these waves at one extremity will be followed by variances at the other extremity; and these variances may be limited to dynamic disturbances only, or they may go on to produce material, i. e., structural, disturbances also; and further, that these waves may be reflected on to other parts, and produce disturbances, dynamic or material in them; or dynamic in one part, and material in another.

The causation of attacks of migraine would appear to be somewhat after the following manner. In the first place the neurine is intrinsically deranged owing to imperfect nutrition or development. Imperfect supplies of nerve force being sent to the chylopoietic viscera, their action becomes imperfect, the blood is imperfectly manufactured, and the disorder of the neurine becomes worse. The effects of dyspepsia in one or other of its forms, produce considerable local disorder in the terminal fibrilla of the vagus; this is propagated to the cerebral centre and induces an attack; or there may be uterine disorder followed by the same result; or the blood may become so deranged as to induce an attack by its action on the cerebral matter; or neurine of the hemispherical ganglia may become disordered by emotional causes, or long continued mental exertion, and an attack be commenced above and be propagated downwards; or the terminal fibrilla of the ophthalmic nerve may be affected by external causes acting upon them, as cold, and an attack be induced. But the peripheral causes are insufficient without the concurrence of the central cause.

It is evident that the condition is one of increased molecular movement in the neurine itself; for the neurine can be only in a state of rest, or in a state of motion; if it is in a

state of rest no force is transmitted, no action of any kind can take place; if the movement is normal, the state is one of comfort not pain; it can only, therefore, take place with increased movement; and molecular movements being once increased, a dilatation of the blood vessels, and an increased supply of arterial blood naturally follow, and this tends to keep up the abnormal movement. Then again, the attack generally terminates during sleep; in other words during the inactivity of sleep, the movements tend to return to their normal degree, just as all movement in the body then becomes lowered. Moreover, the effect of improved nutrition and increased stability, or lessened mobility, of the neurine is to stave off the attacks for an indefinite period.

The treatment of this disorder is on the whole, most unsatisfactory—while the remedies recommended are legion, the curative efforts are mainly directed towards the wrong portion of the causation. Other persons have gastric troubles or uterine troubles, etc., etc., and do not have migraine; others are exposed to heat, cold, or wet, to privation and want, and do not have migraine; yet the people are suffering again and again from a repetition of such attacks, induced sometimes by one cause, sometimes by another. The periphery receives attention, while the centre is neglected, or the only endeavor is to remove the central disturbance, i. e., the pain, immediately, and then trust to chance for its remaining absent for a longer or a shorter time, until the next attack.

Attacks of migraine exhibit very great variations in their amenability to treatment; thus sometimes they may be aborted by a brisk cathartic; if they are commencing, they may be checked by some carbonate of soda, carbonate of magnesia, or aromatic spirits of animonia, in plain water; occasionally attacks are checked by food, and sometimes by a raw apple or a raw turnip.

At other times they may be checked speedily by an emetic of thirty grains of ipicacuanha, or by a brisk saline cathartic.

Trousseau and Pidoux in their *materia medica*, mention how guarana had been for several years used successfully to abort or check migraine; but in the majority of cases it ultimately lost its effects and was discontinued.

Valerianate of zinc in a few large doses, from six to ten grains, has occasionally seemed to abort an attack.

*Cannabis indica* and ergot, have been also each followed by relief—so also has nitrate of soda, in doses of two drachms.

In fact, the list of remedies for migraine that have been reported as successful, would of itself fill a volume. And yet the attacks return.

As the essence of the attack lies in a deranged condition of the neurine, and as the condition of the neurine is intimately related to the purity of the blood stream, it is evident that the first attempt must be to remove any disordered condition of the blood. The first remedy to the disordered centre must be a full supply of healthy blood. The diet should be most carefully limited to the plainer articles of food, and the progress of digestion carefully watched, and if the case prove obstinate, the excretions should be thoroughly examined. Abundance of exercise should be taken in the open air, and the clothing should be sufficient to prevent a chilling of the skin; at the same time if possible the chances of malarial poisoning should be guarded against.

The next point is to rectify any peripheral disturbance whether gastric, or uterine; or if the attacks depend on disorder of the upper nerve centres, to limit the amount of work imposed on them.

The next point is to re-establish the integrity of the neurine, i. e., to reduce its mobility, and this may be accomplished by arsenic, or by phosphorus, combined with cod liver oil.

As a matter of course any other intercurrent morbid conditions require to be removed by suitable means.

The particular relation of the individual to special remedies requires in this disorder close attention.

But the man of business cannot leave his business; the literary man cannot leave his studies, nor the professional man his work; their daily bread depends on their following their different pursuits; the fashionable lady will not relinquish the excitement of society, the hard working woman has no time to lay herself up; and yet in all of these, and in a hundred other conditions of life, the physician is required to control these attacks. Alteratives and nervine tonics may assist in

accomplishing this, but after a time these lose their effect, and unless the disorder subsides with the approach of old age, as the neurine becomes then naturally more solid as do most other tissues of the body, it may still continue to harass and annoy.

If digestion and assimilation be properly performed, if abundance of oxygen be absorbed and the depurative functions be normal, if there is a due allowance of sleep, so that the tissues can fully repair their loss, the attacks of migraine will be reduced nearly to zero; the hygiene of camp life, or of travelling, may postpone an attack for years.

Migraine is often the result of some injurious habits, and these habits are the particular delight, and give direction to the life of the patient; thus it becomes almost impossible to break them off; and this gives the great difficulty in the treatment; yet it must not be forgotten that attacks of migraine may be the precursors of other disorders of the nervous system, either in the individuals so affected, or by the transmission of the nervous temperament in their offspring; and this consideration should be impressed on the minds of those affected with this disorder, so as to induce them, if it be possible, to adopt such a course of life as will tend to strengthen the nervous system and bring it into a healthy and normal condition; by which means they will not only save themselves much suffering, but they will also, in all probability, produce a more healthy offspring.

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